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TABLET PRESS, IN PARTICULAR A ROTARY TABLET PRESS [TABLETTENPRESSE, INSBESONDERE RUNDLAUF-TABLETTENPRESSE]

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Tablet Press, in Particular Rotary Tablet Press

The invention concerns a tablet press, in particular a rotary tablet press, whose workspace comprises a rotary die plate containing the stamps and dies, as well as a filling and dosing device having a feed shoe and provided with a drive unit, which is connected to a discharge opening of a material container, and in which the machine drive is arranged in the base of the machine.

It has been difficult until now to ensure the purity of tablets in the pharmaceutical industry especially during packaging due to the fine dust of molding compound produced during pressing. The more powdery the molding compound is, the more dust will be contained in the air within the workspace and in the direct vicinity of the press. The manufacturing room is therefore frequently polluted with dust particles, which can originate from different presses located in the room. In pharmaceutics, however, even traces of contaminants in the produced tablets are frequently harmful. However, also the particles of pressed

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medicinal molding compound that are inhaled in the manufacturing room can frequently be harmful to the operators of a tablet press. The dust-free production of

medications pressed into tablets is particularly important in the production of human pharmaceutical specialties, which can contain, among other things, highly poisonous alkaloids.

It is an object of the invention, for this reason, to make available tablet presses, in particular rotary tablet presses, which are guaranteed to meet higher expectations with regard to a completely dust-free working environment with high purity of the produced tablets.

This object is attained with the invention by building a cabinet on the machine base, which encloses the entire workspace of the tablet press, arranging the material container on the outside of the cabinet, arranging a filter in the cabinet for the air discharged into the cabinet, and suction nozzles for the air containing dust, in particular at the locations where dust accumulates, and providing the cabinet with a tablet discharge opening having an air barrier, at which air is likewise extracted by suction. A tablet press such as this works fully dust-free with a continuous tablet discharge. The production of tablets is carried out approximately under atmospheric pressure conditions in the cabinet. Optimal conditions for dust-free pressing are created in this way. The medicinal dust can neither escape from the cabinet nor reach through the

tablet discharge opening into the cabinet. The air barrier located at the tablet discharge opening prevents both of these effects, even though it allows the free passage of the produced tablets. The material container located outside of the cabinet contributes to an increased freedom from dust.

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The feeding of the press must be carried out completely dust-free when processing molding compound containing toxins.

A material feeding nozzle with a check valve is arranged for this purpose on the roof of the cabinet, and the cabinet is set up in addition for connecting a pressure compensation line to a sealed material container, which can be screwed onto the material feeding nozzle. Special delivered air-tight containers, which are positioned just like the cabinet for connection to the pressure compensation line, are available for this purpose, so that the material container is under the same pressure as the cabinet, and the molding compound can be guided entirely without producing dust from the sealed material container to the feeding shoe of the filling and dosing device.

In order to produce the air barrier present at the tablet discharge opening of the cabinet during continuous

operation of the tablet press, the tablet discharge opening can have a tubular die on the outside of the cabinet, where all of the drawn air containing dust is filtered free of dust and guided within the circuit back into the cabinet. The tablets pass through the free passage chamber of the tubular die. The loose molding compound, which was dragged along by the tablets as they were expelled from the die and as there were wiped off the die plate, is removed. The air barrier prevents in addition the inlet of air containing dust into the interior of the cabinet. A small amount of fresh air enters at this point into the circuit. A specific low excess pressure can be maintained inside the cabinet by adjusting the amount of filtered air fed into the cabinet and the amount of air containing dust extracted by suction from the cabinet itself. A greater amount of air than the amount of air extracted by suction by the suction nozzles is introduced into the cabinet for this

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purpose. The air drawn into the tubular die is then used to form the air barrier.

An advantageous and preferred further development of the invention consists in thermally insulating the partially glazed cabinet and providing its interior with measuring probes for pressure, temperature and humidity,

and connecting it to an climate control unit of known design as well as to a suction apparatus, which is in constant circular flow, and can be uniformly air conditioned according to predeterminable values of the air temperature, air humidity, and air pressure, independently from any occurring operational fluctuations over the control circuit of the climate control unit. The operational fluctuations can have their origin in changes in the indoor temperature and the changing working conditions during pressing, when the pressing characteristics of the material change, for example, due to wall friction occurring within the die. The cabinet in interaction with the climate control unit becomes a climate chamber, in which the pressing of tablets is carried out independently from any possible operational fluctuations and always under the same stable climatic conditions.

It is advantageous to configure a door on the back of the cabinet, on which are arranged an air connection, a distribution channel, as well as a frame and grid for insertable dust filter units, whose permeability can be monitored by means of the pressure measuring probes arranged in the cabinet. The cabinet can have, in addition, UV light barriers in the area of the air inlet as well as UV radiators in the interior, which can be rotated and

adjusted. The irradiation with ultraviolet light causes that the produced tablets are particularly free of germs. A gas, which is inert with regard to the molding compound, for example, nitrogen or a noble gas, can be provided in the circuit instead of air.

The tablet discharge opening of the cabinet or the climate chamber can be connected to a tablet trimming device of known design and the latter can in turn be connected to a receptacle for the tablets, which can be sealed air-tight, wherein the tablet trimming device is connected to the suction line of the circuit.

The tablet press according to the invention, in particular a rotary tablet press, makes available to the pharmaceutical industry the until now unavailable possibility of industrially processing medicinal molding compounds under the strictest safety conditions with the highest purity of the end product. It makes possible a continuous dust-free tablet production, wherein the feeding of the press is carried out from a delivered sealed material container and the tablets produced in the fully air conditioned workspace within the climate chamber drop again into an air-tight sealable receptacle.

The tablet press can be shut down by means of a monitoring device of known design, which can be adjusted to a minimum pressure, through a constant monitoring of the filter units located in the air circuit during the passage into the interior of the cabinet. In this case, the fine dust filter units, which are located on the rear door of the climate chamber, must be exchanged for new ones.

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The object of the invention is a rotary tablet press represented in the exemplary embodiment shown in the drawings, wherein:

Fig. 1 shows a top view of the tablet press according to the invention with a tablet trimming device connected thereto;

Fig. 2 shows a detail of Fig. 1;

Fig. 3 shows a lateral view of Fig. 1; and

Fig. 4 shows a plan view of the tablet press of Fig. 1 with an attached suction apparatus and climate control unit, both shown in schematic representation.

The machine base 1 of the rotary tablet press comprises the machine drive, which is not shown. The rotary die plate 2 incorporates the dies 3, whose ends form the lower stamps 4. The pressing of the molding compounds fed into the die is carried out between the lower stamp 4

and the upper stamp 5, which are axially guided in part of the die plate and are moved toward each other and away from each other in their axial direction during the rotation of the die plate through curves, which are not shown. The stamps 4 and 5 press the molding compound 28 fed into the dies into tablets. A known filling and dosing device 6 with a feeding shoe 7 and dosing vanes arranged therein, which is not shown because this kind of filling and dosing device is known, is used for filling and dosing. It is driven by means of its own drive unit 8, whose electric motor is identified with reference numeral 9. A control panel 10 and a hand wheel 11 arranged underneath it for speed adjustment are located on the machine base. The speed adjustment of the die plate is carried out by steps within two main speed ranges, slow and fast. The filling and dosing device can be actuated separately from the drive

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of the die plate in order to set up the machine. The die plate can be rotated manually in order to adjust it. The optimum filling of the dies is determined with the adjustment of the machine. The desired data regarding the molding pressure, tablet height, and tablet weight, which are secured with the automatic operation, can be adjusted based on the press blanks.

The rotary tablet press described until now is known. However, it does not function without dust within the workspace delineated by the stamps, die plate, and filling and dosing device. Tablets with a guaranteed degree of purity cannot be produced with it.

A cabinet 12 is mounted on mounting brackets 13 on the machine base according to the invention. The base plate 14 as well as the walls and roof of the cabinet have double walls. The intermediate space is filled with heat insulating material 15. The cabinet is partially glazed. The front door 15 has a heat insulating double window 17. On the side opposite to the door handle 18 is located a handle, which is mounted on the lateral wall of the cabinet serving as support when the tightly closing front door is opened. The right and left lateral walls of the cabinet incorporate fixedly installed viewing windows 19, which are heat insulated like the front window. The front door is sealed air-tight.

On the roof 20 of the cabinet is located a material feeding nozzle 21 with a check valve 22 and a bellows 23 for connecting the sealed material container 24, whose check valve 25 has a screw connection for connecting to the bellows 23. The material container has two lateral

journals 26, with which it can be hung in two angle brackets 27 with the opening facing downward.

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The medicinal molding compound 28 to be pressed is located in the air-tight container. The container has a further check valve 29 close to the bottom for connecting to a pressure compensation line 30, which ends in the roof of the cabinet and connects in its interior 31 with the material container 24 for pressure compensation. The pipe 32 that leads to the material feeding nozzle connects to the filling and dosing device 6 and is connected via a further check valve 33 to the feeding shoe 7. As soon as the check valves 22, 25, 29 and 32 are open, molding compound 28 flows into the feeding shoe 7 in proportion with the adjusted opening cross section. The filling of the dies with molding compound from the sealed container 24 as well as the pressing of the molding compound into tablets is carried out inside the cabinet 12, which encloses in dust-tight manner the entire workspace of the tablet press. The base plate 14, which represents the bottom of the cabinet, has a tablet discharge opening 34. Between this opening and the die plate is located a diagonally inclined channel 35 for a continuous tablet discharge. The tablets fall through the discharge opening

34 and through the tubular die 36 located on the outside of the cabinet, which is connected to a suction line 37. The tubular die is connected to a check valve 38, whose central opening 39 can be adjusted to the desired opening cross section at the lever 40, as shown in phantom outline in Fig. 2. Fig. 2 shows the tubular die in enlarged scale. The suction line 37 ends in an annular chamber 41. The inner tube 42 has a multitude of radially stationary die orifices 43, through which air is drawn by suction from the interior of the tubular die. If case external air penetrates from the manufacturing chamber in the direction of the arrows 44 into the tubular die, this portion of air is likewise drawn by suction through the suction line 37 in the direction of the arrow 45, like the residual air containing dust from the interior 31 of the cabinet 12. The air barrier that forms within the tubular die prevents the penetration of

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outside air into the cabinet 12.

In the interior 31 of the cabinet 12 are arranged suction nozzles 46 of the rotating die plate 2, in particular in the areas where dust accumulates, of which only two suction nozzles are shown in Fig. 4 for reasons of clarity. All suction nozzles are connected by means of hose lines 47 to a main connection nozzle 48, which is

located on the bottom of the cabinet 12, and which is connected via a further suction line 37a. The lines 37 and 37a lead to the suction apparatus 49 of known design, which is schematically represented in Fig. 4. The pressure side of the suction apparatus is connected to a climate control unit 50 of known design by means of the hose-pipeline 51. The climate control unit is connected via the pipeline 52 to the air supply connection 53 of the cabinet 12, which is uniformly air conditioned by means of the connection of the climate control unit 50 and becomes a climate chamber.

The rear side of the cabinet or climate chamber is configured as a door, which is identified with reference numeral 54 (Figs. 3 and 4). The door has hinges 55. The air supply connection 53 is located on the door, which is configured on the back as a distribution channel 56 with baffle plates 57 arranged therein as well as with frames 58 and grids 59 for insertable dust filter units 60. UV light barriers 61 are located in the region of the air intake. The interior also has several UV radiators 62. The UV light barrier 61 and the UV radiator 62 can be adjusted form outside by means of twistable operating controls 63. The UV light barriers and UV radiators ensure that the air in the cabinet is free of germs; the air can also be replaced with a gas, which is inert with respect to the

molding compound, for example, nitrogen or a noble gas, such as, for example, helium, which is in permanent circulation.

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The air conditioned by the climate control unit 50 can be uniformly conditioned according to preselectable values of air temperature, air humidity, and air pressure via control circuits of the climate control unit. The control circuits belong to the known climate control units. Within the climate chamber are located measuring probes 64, 65 and 66, which function as sensors for temperature, pressure and humidity, wherein the data actually measured within the climate chamber are inputted into the control circuits of the climate control unit in order to carry out a continuous actual and target value comparison between the set and the measured data and be able to readjust the climate control unit to the set values.

This adjustment is essential, since the operating temperature of the machine can already fluctuate between 28°C and 41°C in dependence upon the working speed, the press material, the machine settings, and the ambient temperature. The control circuits of the climate control unit make possible a uniform climate control of the interior of the cabinet.

The amount of dust-free conditioned air, which penetrates into the climate chamber and passes the UV light barrier, is greater than that drawn in by the suction nozzles 46. The remaining excess pressure with respect to the amount of air that is not drawn in through the tube 37 inside the tubular die 36 and serves thus to form the air barrier. The press material, which is dragged along by the tablets when the die plate 2 is wiped off is also extracted at this point.

The tablet press can also work together in combination

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with a tablet trimming device 67 of known design. It is likewise connected to the suction line 37. The trimming device is connected air-tight to the tubular die 36 and the check valve 38 by means of the hose 68. The device 67 causes that the slight flash produced on the tablets during pressing as well as the loose press material that adheres to the surface can be removed without leaving residue behind. The discharge pipe 69 of the trimming device leads into the receptacle 70, which can be sealed air-tight, into which the finished tablets drop. The check valve 71 is arranged on the discharge pipe 69. The check valve 72 is located on the receptacle 70. Between these two is located

a connection 73, which connects the two check valves to each other.

The connections of the tablet trimming device make possible a tablet transport from the press in the trimming device and from the latter into the receptacle, which is air-tight with regard to ambient air.

The necessary suction power of the suction apparatus is at about 900 to 1500 m^3/h, depending on the size and capacity of the tablet press.

If a full climate control of the interior 31 of the cabinet can be temporarily dispensed with, the climate control unit 50, insofar as it is present, is switched off. A connection between the hose-pipeline 51 and the pipeline 52 can thus be produced without interconnecting the climate control unit 50.

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Patent Claims:

1. A tablet press, in particular a rotary tablet press, whose workspace comprises a rotary die plate containing the stamps and dies, as well as a filling and dosing device having a feed shoe and provided with a drive unit, which is connected to a discharge opening of a material container, and in which the machine drive is arranged in the base of the machine, characterized in that a cabinet (12), which

tightly encloses the entire workspace of the tablet press, is built on the machine base (1), the material container (24) is arranged outside of the cabinet, dust filters (60) for air introduced into the cabinet, and suction nozzles (46) for air containing dust are arranged in the cabinet, in particular at the points where dust accumulates, and the cabinet has a tablet discharge opening (34) having an air barrier, at which air is likewise drawn in.

2. The tablet press, in particular a rotary tablet press, of claim 1, characterized in that a material feeding nozzle (21) having a check valve (22) is arranged on the roof (20) of the cabinet (12) and the cabinet (12) is set up for connecting a pressure compensation line (30) to a sealed material container (24), which can be screwed onto the material feeding nozzle (21).

3. The tablet press, in particular a rotary tablet press, of claim 1, characterized in that the tablet discharge opening (34) has a tubular die (36) with a connection to a suction line (37) of a suction apparatus (49) outside of the cabinet (12), wherein the total of

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drawn air containing dust is filtered free of dust and guide back within the circuit into the cabinet (12).

4. The tablet press, in particular a rotary tablet press, of claims 1 to 3, characterized in that the partially glazed cabinet (12) is thermally insulated and is provided in its interior with measuring probes (64, 65, 66) for temperature, pressure, and humidity, and is connected to a climate control unit (50) of known design as well as to a suction apparatus (49), which are both mutually connected to a hose-pipeline (51), so that the air conditioned by the climate control unit, which is in constant circular flow, can be uniformly air conditioned according to predeterminable values of the air temperature, the air humidity, and the air pressure, independently from any occurring operational fluctuations over the control circuit of the climate control unit.

5. The tablet press, in particular a rotary tablet press, of claim 4, characterized in that the rear side of the cabinet (12) is configured as a door (54), on which is located an air supply connection (53), a distribution channel (56), as well as frames (58) and grids (59) for insertable dust filter units (60), whose permeability can be monitored by means of the pressure measuring sensors arranged in the cabinet.

6. The tablet press, in particular a rotary tablet press, of claim 4, characterized in that the cabinet has UV

light barriers (61) in the area of the air inlet as well as UV radiators (62) in the interior, which are rotatably configured and are adjustable.

7. The tablet press, in particular a rotary tablet press, of claims 3 and 4, characterized in that a gas, which is inert with respect to the molding compound (28), can be provided in the circuit instead of air.

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8. The tablet press, in particular a rotary tablet press, of claim 1 and one of the subsequent claims, characterized in that the tablet discharge opening (34) of the cabinet (12) is connected to a tablet trimming device (67) of known design, and the latter is connected to a receptacle (70) for the tablets, which can be sealed air-tight, wherein the tablet trimming device is connected to the suction line (37) of the circuit.

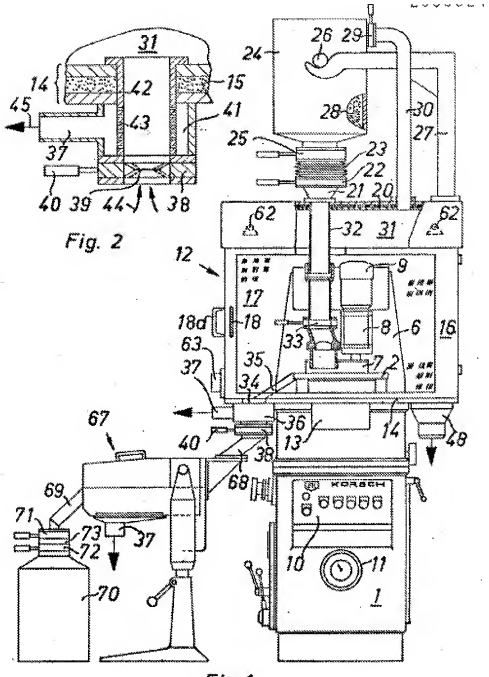
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Fig. 2

Fig. 1

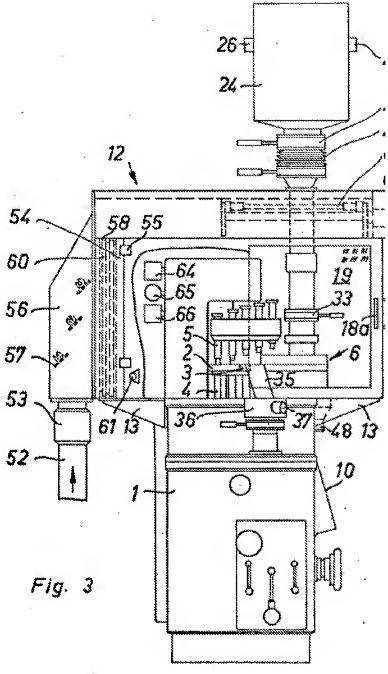
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Fig. 3

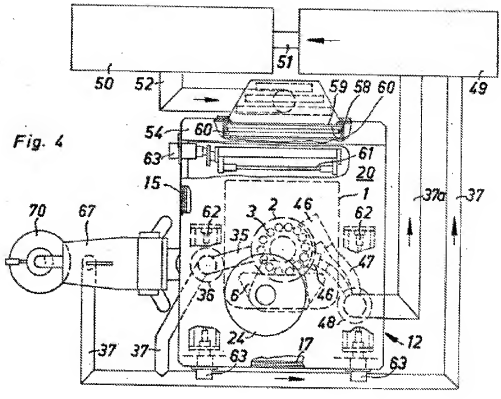
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Fig. 4